

REMARKS

This Preliminary Amendment cancels, without prejudice, claims 1 to 26 in the underlying PCT Application No. PCT/NL2004/000528 and adds new claims 27 to 52. The new claims, inter alia, conform the claims to United States Patent and Trademark Office rules and does not add any new matter to the application.

In accordance with 37 C.F.R. § 1.125(b), the Substitute Specification (including the Abstract) contains no new matter. The amendments reflected in the Substitute Specification (including Abstract) are to conform the Specification and Abstract to United States Patent and Trademark Office rules or to correct informalities. As required by 37 C.F.R. §§ 1.121(b)(3)(ii) and 1.125(c), a Marked-Up Version of the Substitute Specification comparing the Specification of record and the Substitute Specification also accompanies this Preliminary Amendment. Approval and entry of the Substitute Specification (including Abstract) are respectfully requested.

The underlying PCT Application No. PCT/NL2004/000528 includes an International Search Report, dated November 15, 2004, a copy of which is included. The Search Report includes a list of documents that were considered by the Examiner in the underlying PCT application.

It is respectfully submitted that the subject matter of the present application is new, non-obvious and useful. Prompt consideration and allowance of the application are respectfully requested.

Respectfully submitted,

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SANDING APPARATUS FOR A SANDING MACHINE

FIELD OF THE INVENTION

The **present** invention relates to a sanding device for a sanding machine, ~~comprising~~ **which may include** a carrier, a sanding element and at least two coupling elements with which
5 the sanding element is coupled to the carrier, wherein a movable connection is provided between the sanding element and the carrier.

BACKGROUND INFORMATION

10 Such a sanding device is ~~known from~~ **described in PCT International Published Patent Application No. WO 96/34721.**
In this ~~known~~ sanding device, a sanding element is connected via two pivot arms to a carrier which is releasably connected to the sanding sole of a sanding machine. The sanding element
15 consists of a flexible support plate with pads to which a piece of sandpaper is fixed. On one side the pivot arms are mounted pivotally on the support plate and on the other arranged slidably in slotted holes in the carrier. The ends of the pivot arms can be fixed in the slotted holes via nuts.
20 For sanding purposes the curvature of the support plate is adjusted as desired by sliding the pivot arm ends in the slotted holes and fixed in place by tightening the nuts. The sanding element thus has a fixed position during sanding.

A drawback of this ~~known~~ sanding device is that it ~~[[is]]~~
25 **may be** a relatively complex construction, while the degree of flexibility ~~[[is]]~~ **may be** very limited, particularly during sanding of surfaces with a radius of curvature.

SUMMARY

30 ~~[[The]]~~ **An example embodiment of the** present invention ~~has for its object to provide such~~ **may provide** a sanding

device, the construction of which is simpler and more suitable for sanding surfaces with different radii of curvature.

~~This object is achieved in that the ends~~ **Ends** of the coupling elements coupled to the sanding element ~~can~~ **may** move
5 relative to each other during sanding.

The coupling elements only support the sanding element at the ends. In the center of the sanding element, the sanding element is not supported, so that it is sufficiently flexible. Because these ends of the coupling elements ~~can~~ **may** move
10 relative to each other, the radius of curvature on the surface for sanding ~~can~~ **may** be adjusted during sanding.

The coupling elements ~~can~~ **may** themselves be flexible here in order to provide the desired movement. It is, however, also possible for the coupling elements to be hinged
15 connected to the carrier. Both variants ~~can~~ **may** also be combined.

~~According to one embodiment, the~~ **The** device comprises ~~means~~ **may include a device** for urging the coupling elements apart at least at the position of the sanding element. An
20 additional tensioning force is hereby generated in the sanding element, whereby the normal force to be exerted by the sanding element, and thereby the sanding force, is greater.

Since it is expected that in practice such a sanding device will usually be used to sand round surfaces such as
25 pipes, it is attractive when the sanding surface ~~can~~ **may** curve in accordance with a cylinder, this being facilitated by the measure that the sanding element is connected to two coupling elements and that the connecting lines between the coupling elements on the one hand and the sanding element on the other
30 extend substantially parallel.

~~Another embodiment provides the measure that the~~ **The** sanding element comprises **may include** a flexible supporting element connected fixedly to the coupling elements, for the purpose of supporting a sheet of sandpaper for connecting
35 thereto. The supporting element connected fixedly to the

coupling elements is, for instance example, formed by a piece of fabric or other flexible material, which ~~is preferably~~ may be provided with Velcro material for attaching a sheet of sandpaper or sand cloth thereto. This sandpaper or sand cloth
5 ~~must then of course~~ may need to be provided with mating Velcro material. It is otherwise also possible to make use of a supporting element into which the Velcro material is already integrated.

~~A specific embodiment provides the measure that the~~ The
10 coupling elements are may be connected to a base, and that the base ~~[[is]]~~ may be releasably connected to the carrier.

~~Another embodiment provides the measure that the~~ The
sanding element ~~has~~ may have the form of a closed sanding belt which extends around the combination of coupling elements and
15 base. It hereby becomes possible to make use of annular belts of sanding material, wherein these ~~can~~ may be mounted with a simple operation. The use of a support for the sandpaper or sand cloth between the coupling elements ~~[[is]]~~ may be
unnecessary here. Replacement of the sandpaper ~~is moreover~~
20 may be easier.

~~According to a further aspect of the invention, the~~ The
base ~~[[is]]~~ may be connected releasably and rotatably to the carrier in order to facilitate sanding. In addition to
rotation of the sanding element, this measure provides the
25 option of exchanging the sanding element, together with the base and the coupling elements, for a similar combination with a different configuration or shape. Other processing elements
~~can~~ may moreover be placed, such as a rigid sanding element or an element adapted to carry out a process other than sanding.

30 In addition, the base ~~can~~ may be releasable in at least one angular position of the carrier. Use is, for instance example, made here of a configuration of a bayonet fitting, wherein the fitting is in the locked position in an active position of the sanding element.

~~Other attractive preferred embodiments are stated in the remaining claims.~~

The present invention further relates to a sanding machine comprising that includes a sanding sole and a sanding device, wherein the carrier of the sanding device ~~can~~ may be formed by the sanding sole of the sanding machine or the sanding device ~~can~~ may be releasably connected to the sanding sole of the sanding machine.

The Example embodiments of the present invention will be elucidated ~~hereinbelow~~ are explained in more detail below with reference to the ~~annexed drawings, in which:~~ appended Figures.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic perspective view of a ~~first embodiment of~~ a sanding machine according to an example embodiment of the present invention[[]].

Figure 2 is a detail view with exploded parts of a part of the sanding machine ~~shown~~ illustrated in figure Figure 1[[]].

Figure 3 is a schematic perspective view of a ~~second embodiment of the~~ sanding machine according to an example embodiment of the present invention[[]].

Figure 4 is a detail view with exploded parts of a part of the sanding machine ~~shown~~ illustrated in figure Figure 3[[]].

Figure 5 is a schematic perspective view of a ~~further embodiment of a~~ sanding device according to an example embodiment of the present invention[[]].

Figure 6 is a schematic perspective view of a ~~further embodiment of a~~ sanding device according to an example embodiment of the present invention[[]].

Figure 7 is a schematic perspective view of a ~~final embodiment of a~~ sanding device according to an example embodiment of the present invention, wherein in which a part is removed[[]].

Figure 8 is a view corresponding with ~~figure~~ **Figure** 7, with all parts shown[[]].

Figure 9 is a side view of the releasable part of the sanding device ~~shown~~ **illustrated** in figures 7 and 8[[]].

5 Figure 10 is a perspective top view of the releasable part of the sanding device ~~shown~~ **illustrated** in ~~figures~~ **Figures** 7 and 8[[]; and[]].

Figures [[11A-G]] **11A to 11G** show different variants of sanding elements which are connected releasably and rotatably
10 to a carrier.

DETAILED DESCRIPTION

Figure 1 ~~shows~~ **illustrates** a sanding machine designated as a whole with 1, which is provided with a sanding sole 2.

15 In the manner of a ~~prior-art~~ **conventional** sanding machine, this sanding sole 2 ~~can~~ **may** be provided with a piece of sandpaper or sand cloth for performing a surface sanding operation. Sanding machine 1 is herein adapted to drive sanding sole 2 such that it executes a reciprocal movement.
20 This ~~can~~ **may** be a movement back and forth but may also be a rotating movement, or a combination of both types of movement.

A carrier 3 is fixed onto sanding sole 2. This carrier 3 is connected to sanding sole 2, for instance **example**, by means of a snap connection or as according to the method described
25 in EP-A 1166963 **European Published Patent Application No. 1 166 963.**

In addition to carrier 3, the sanding device for sanding machine 1 ~~shown~~ **illustrated** in ~~figures~~ **Figures** 1 and 2 ~~comprises~~ **includes** a sanding element 9, 10 and two coupling
30 elements 8 with which sanding element 9, 10 is coupled to carrier 3.

Carrier 3 is provided with two hinge constructions 4 extending in parallel as ~~shown~~ **illustrated** in ~~figure~~ **Figure** 2. Each of these hinge constructions 4 is formed by a retaining
35 element 5, which is formed integrally with carrier 3 and a

shaft 6. Shaft 6 is provided with protruding end parts 7 which ~~can~~ may be received by ~~means of~~ a snap connection in recesses 29 arranged in retaining elements 5. Hinges 6 are formed integrally with coupling elements 8.

5 The two coupling elements 8 are coupled to a sandpaper supporting element 9 manufactured from flexible material. This sandpaper supporting element 9 is connected for this purpose to coupling elements 8 by ~~means of~~, for instance example, gluing or another type of connection. On its
10 outside, the sandpaper supporting element 9 is provided with Velcro material. Sandpaper 10 ~~can~~ may be arranged on the sandpaper supporting element 9 by ~~means of~~ a Velcro connection.

As ~~can be seen~~ illustrated in figure Figure 1, it is
15 possible to sand a curved surface, for instance example, a pipe 11, using the thus formed sanding device.

The majority of the workpieces to be sanded by such a sanding machine 1 have a cylindrical surface. It is therefore attractive, as in the above elucidated embodiment, for hinges
20 4 to extend parallel to each other. Sanding element 9, 10 will take on the form of the sanding surface as a result of the movable connection between sanding element 9, 10 and carrier 3, in that the ends of coupling elements 8 coupled to sanding element 9, 10 ~~can~~ may move relative to each other.
25 The flexibility of supporting element 9 and sanding machine 10 also contribute hereto.

Although this will occur less frequently in practice, it is ~~in principle~~ also possible to sand non-cylindrical objects with such a sanding device. It is possible to consider having
30 the hinges 6 extend at a certain angle for this purpose.

Figures 3 and 4 ~~show~~ illustrate another example embodiment of the present invention, which relates principally to the manner in which the sandpaper is attached.

~~In the embodiment shown~~ As illustrated in figures Figures
35 3 and 4, use is made of an annular piece of sandpaper 12 which

is placed round a combination 13. This combination 13 is formed by a base 14 to which two coupling elements 16 are connected by ~~means of~~ hinges 15. The dimensions of the annular piece of sandpaper 12 and combination 13 are such that, in the ~~situation shown~~ arrangement illustrated in figure Figure 4, sandpaper 12 is as flat as possible at the position of the sanding surface. In this ~~situation~~ arrangement, the combination 13 with sandpaper 12 arranged thereon is pushed into a clip 17 arranged on carrier 3. Clip 17 fixedly clamps the combination with the sandpaper 12 arranged therearound.

As a result of the ~~fact that~~ combination 13 ~~[[is]]~~ being integrally formed, coupling elements 16 will have a preferred position. They will be urged into this preferred position. A stretching force is hereby exerted on the part of sanding belt 12 adapted for the sanding operation. In the foregoing example embodiment, there is no such preferred position. This ~~can of course~~ may be arranged as desired. The relevant ~~means~~ device(s) may be provided for this purpose.

An advantage of the example embodiment ~~shown~~ illustrated in figure Figure 4 is that sandpaper 12 ~~can~~ may be used more completely. After the uppermost piece of sandpaper 12 has been used, the annular sandpaper 12 ~~can~~ may be rotated and a subsequent piece of sandpaper 12 ~~can~~ may be used.

The example embodiment ~~shown~~ illustrated in figure Figure 5 ~~comprises~~ includes a carrier 3 in the form of a sanding sole for releasable connection to a sanding machine, on which sole a base 14 is rotatably mounted. On base 14 are arranged two coupling elements 16 which are manufactured from flexible material. At least the distal ends of these coupling elements 16 are connected to a sanding element ~~(not shown)~~. In this example embodiment, the coupling elements 16 and base 14 are embodied arranged integrally.

Base 14 is provided with a shaft ~~which is not shown in the drawing and~~ which extends into carrier 3 perpendicularly of carrier 3. Base 14 is provided with a nose ~~which is not~~

~~shown in the drawing and~~ which engages under a substantially L-shaped edge 18 fixed to carrier 3. This edge 18 extends in a circular arc.

Base 14 is secured on carrier 3 in that the nose
5 protrudes below L-shaped edge 18. Base 14 ~~can~~ may be removed by rotating the nose from under edge 18. Base 14 ~~can~~ may be locked on carrier 3 in diverse angular positions, e.g., by ~~per se known~~ conventional locking ~~means~~ devices, such as an elevation 25 as ~~shown~~ illustrated in figure Figure 5 in co-
10 action with a corresponding recess in the bottom of base 14. The action of a bayonet fitting is obtained here.

Rapid exchange of the base 14 with the sanding element arranged thereon is thus possible, wherein a good connection to base 14 is obtained despite this advantage, this being
15 important in respect of the transfer of forces during sanding. This fastening otherwise provides the option of rapid replacement of base 14 by a base on which is placed a sanding element with a different configuration. As well as a flexible sanding element, it is thus possible, for instance example, to
20 apply a substantially rigid sanding element with a form adapted to the operation to be performed, such as a concave, convex, folded form or with a sharp point, etc.

~~The advantages~~ Advantages obtained with the above discussed example embodiment ~~can however~~ may also be obtained
25 with the example embodiment ~~according to figure~~ illustrated in Figure 6.

In the example embodiment ~~of figure~~ illustrated in Figure 6, the reference numeral 3 designates the sanding sole of the sanding machine ~~(not further shown)~~ since this fulfills the
30 function of carrier 3. A clamping element 20 is connected rotatably to sanding sole 3. Clamping element 20 is mounted for this purpose on carrier 3 by ~~means of~~ a shaft 21. The clamping element is provided with a U-shaped end part 22 and a pair of ridges 23. Ridges 23 continue as side walls 27 and

28, of which the wall 28 is ~~shown~~ indicated broken-away in figure Figure 6.

A base 14, on which a sanding element ~~can~~ may be mounted via coupling elements or an element for performing another
5 type of process ~~can~~ may be directly mounted, is provided with two noses 24, 26. In the position of clamping element 20 ~~shown~~ illustrated in figure Figure 6, the first nose 24 ~~can~~ may be pushed into U-shaped end part 22 and the second nose 26 ~~can~~ may be placed between ridges 23. The thus obtained
10 assembly ~~can~~ may then be rotated until the second nose 26 comes to lie under retaining edge 18 and is secured thereby.

Figure 7 ~~shows~~ illustrates a further example embodiment of a sanding device ~~according to the present invention~~. Use is once again made here of a carrier 3, on which is arranged a
15 bearing 30. Bearing 30 is semicircular. An L-shaped edge 18 is further placed on carrier 3, as in the foregoing example embodiment. Recesses 31 are arranged in the upper side of the L-shaped edge.

In the present example embodiment, the base 14 takes the
20 form of a flat plate 32 which is provided at one end with a disc-shaped part 33. This disc-shaped part 33 fits into bearing 30. The other end 41 of plate 32 extends under the L-shaped profile 18. A connecting piece 34 is arranged on plate 32.

25 The construction of the assembly described up to this point is such that from a separate position the base 14 ~~can~~ may first be placed with its disc 33 into bearing 30 and ~~can~~ may then be rotated in the bearing until distal end 41 of plate 32 is ~~situated~~ arranged under L-shaped profile 18 and is
30 retained there. ~~A situation~~ An arrangement obtained in this manner is ~~shown~~ illustrated in figure Figure 7.

Three recesses 31 are arranged in the upper side of L-shaped edge 18 in order to fix base 14 in one of three possible positions. Arranged on connecting part 34 is a
35 tongue 35 which is provided on its front bottom side with a

protrusion 36 which fits into each of the recesses 31. For this purpose, tongue 35 has a resilient form, so that protrusion 36 ~~can~~ may be placed into any of the recesses 31. The distal end of tongue 35 ~~can~~ may be moved upward again using the fingers, so that protrusion 36 is lifted out of recess 31 and base 14 ~~can~~ may be rotated.

As ~~is apparent from figure~~ illustrated in Figure 8, a sandpaper carrier 38 is arranged on connecting part 34. This ~~can~~ may be placed releasably on connecting part 34 but ~~can~~ may also be arranged fixedly. Sandpaper is attached to sandpaper carrier 38. Sandpaper carrier 38 ~~can~~ may be a rigid element but may also be manufactured from flexible material so that the outer edges thereof ~~can~~ may move relative to each other during sanding, and the curvature of sandpaper carrier 38, including the sandpaper, adapts to the workpiece for sanding.

It is further pointed out that sandpaper carrier 38 is placed obliquely relative to carrier 3. This means that the distance between carrier 3 and sandpaper carrier 38 is greater in the vicinity of tongue 35 than in the vicinity of bearing 30. In other words, the lower and upper edge of connecting part 34 do not extend parallel to each other ~~(see figure 9)~~. This measure has been taken to ~~enable~~ provide better execution of determined sanding operations. Sanding machine 1 ~~can~~ may then be handled more easily while maintaining full contact between sandpaper carrier 38 and the workpiece.

Figure 9 further ~~shows~~ illustrates the separate part of the sanding device, i.e. the combination of sandpaper carrier 38 and base 32, 34 on which it is mounted.

Figure 10 ~~finally shows~~ illustrates the component of ~~figure~~ Figure 9 from above. Here is ~~shown~~ illustrated that on the distal end 41 of plate 32, a chamfering 39 is arranged for easy movement of plate 32 to a position under the L-shaped edge 18. Slots 40 are further arranged in order to form resilient tongues ~~enabling~~ providing practically immobile placing of plate 32 under edge 18.

It ~~will~~ should be apparent that base 32, 34 ~~can~~ may be readily exchanged for a base on which a different sanding element or a different processing element is placed.

Different variants are ~~shown~~ illustrated in ~~figures 11A-G~~

5 Figures 11A to 11G. ~~Shown~~ Illustrated successively are a rigid sanding element of square (~~fig.~~ Fig. 11A), V-shaped (~~fig.~~ Fig. 11B), triangular (~~fig.~~ Fig. 11C), finger-like (~~fig.~~ Fig. 11D), concave (~~fig.~~ Fig. 11E) and convex (~~fig.~~ Fig. 11F) form and a flexible sanding element according to the example
10 embodiment ~~of figures~~ illustrated in Figures 1 and 2 (~~fig.~~ Fig. 11G).

It ~~will~~ should be apparent that numerous variations ~~can~~ may be made to the example embodiments ~~shown here~~ illustrated and described herein.

ABSTRACT ABSTRACT

The invention relates to a A sanding device for a sanding machine (1), ~~comprising~~ includes a carrier (3), a sanding element (9, 10, 12) and at least two coupling elements (8, 16) with which the sanding element (9, 10, 12) is coupled to the carrier (3), ~~wherein a~~. A movable connection is provided between the sanding element (9, 10, 12) and the carrier (3), and ~~wherein~~ the ends of the coupling elements (8, 16) coupled to the sanding element (9, 10, 12) ~~can~~ may move relative to each other during sanding. ~~According to another aspect, the invention relates to~~ Furthermore, a sanding device for a sanding machine (1), ~~comprising~~ includes a carrier (3), a sanding element (9, 10, 12) and at least one coupling element (8, 16) with which the sanding element (9, 10, 12) is coupled to the carrier (3), ~~wherein the~~. The coupling element (16) is connected to a base (14), and ~~wherein~~ the base (14) is connected releasably and rotatably to the carrier (3).